

Unit 9

Day 1

Equations in Quadratic Form

1)

$$2x^4 + 5x^2 = 3$$

$$2x^4 + 5x^2 - 3 = 0$$

$$\text{let } y = x^2$$

$$2y^2 + 5y - 3 = 0$$

$$(2y - 1)(y + 3) = 0$$

$$y = \frac{1}{2}$$

$$x^2 = \frac{1}{2}$$

$$x = \pm \sqrt{\frac{1}{2}}$$

$$y = -3$$

$$x^2 = -3$$

$$x = \pm i\sqrt{3}$$

$$\left\{ \frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}, i\sqrt{3}, -i\sqrt{3} \right\}$$

$$2) \quad 4p^{-2} - 8p^{-1} = 5$$

$$4x^2 - 8x = 5$$

$$4x^2 - 8x - 5 = 0$$

$$(2x + 1)(2x - 5) = 0$$

$$x = -\frac{1}{2} \quad | \quad x = \frac{5}{2}$$

$$p^{-1} = -\frac{1}{2} \quad p^{-1} = \frac{5}{2}$$

$$p = -2 \quad p = \frac{2}{5}$$

$$\text{let } x = p^{-1}$$

Alternative method to Ex2:

$$4p^{-2} - 8p^{-1} = 5$$

$$\left(\frac{4}{p^2} - \frac{8}{p} = 5 \right) p^2$$

$$4 - 8p = 5p^2$$

$$0 = 5p^2 + 8p - 4$$

$$0 = (5p - 2)(p + 2)$$

$$p = \frac{2}{5} \quad p = -2$$

$$3) \quad 2(p^2 + 1)^{-2} - 5(p^2 + 1)^{-1} - 3 = 0$$

$$\text{let } x = (p^2 + 1)^{-1}$$

$$2x^2 - 5x - 3 = 0$$

$$(2x + 1)(x - 3) = 0$$

$$x = -\frac{1}{2} \quad | \quad x = 3$$

$$(p^2 + 1)^{-1} = -\frac{1}{2}$$

$$p^2 + 1 = -2$$

$$p^2 = -3$$

$$p = \pm i\sqrt{3}$$

$$(p^2 + 1)^{-1} = 3$$

$$p^2 + 1 = \frac{1}{3}$$

$$p^2 = -\frac{2}{3}$$

$$p = \pm i\sqrt{\frac{2}{3}}$$

Alternative method to Ex3:

$$2(p^2 + 1)^{-2} - 5(p^2 + 1)^{-1} - 3 = 0$$

$$\left[\frac{2}{(p^2 + 1)^2} - \frac{5}{p^2 + 1} - 3 = 0 \right] (p^2 + 1)^2$$

$$2 - 5(p^2 + 1) - 3(p^2 + 1)^2 = 0$$

$$2 - 5p^2 - 5 - 3(p^4 + 2p^2 + 1) = 0$$

$$2 - 5p^2 - 5 - 3p^4 - 6p^2 - 3 = 0$$

$$-3p^4 - 11p^2 - 6 = 0$$

$$3p^4 + 11p^2 + 6 = 0$$

$$(3p^2 + 2)(p^2 + 3) = 0$$

$$p^2 = -\frac{2}{3} \quad p^2 = -3$$
$$p = \pm i\sqrt{\frac{2}{3}} = \pm i\frac{\sqrt{6}}{3} \quad p = -$$

HOMEWORK: p. 136: 11-26 (all)

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